Clay Deposits and Early Brick-making in Addison County, VT

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Overview

Many of the brick buildings in Addison County serve as historical landmarks or museums, some have been restored and converted to offices, banks, and other community buildings, and some have been left to face the tests of time and weathering. Regardless of their current state, most of the brick structures in Addison County would not be in existence were it not for the geological history of the region.

Geological History of the Region

The main, abundant type of clay found in this region is kaolinite clay. Kaolinite, Al₂Si₂O₅(OH)₄, exhibits both crystal faces and colloidal coatings, which results in the clay's plasticity. Also, the silica and alumina sheets of kaolinite are bonded tightly together by hydrogen bonds, which gives the clay a low shrink-swell capacity. These simultaneous thrusting and extension processes is when the development of the kaolin occurred. The most widely accepted theory is that the kaolinite was being fed by melting glaciers, which deposited eroded material accumulated during their extension. Kaolinite clay particles were one of these deposits. Because of their fine grain size, glacial streams easily transported clay particles, which did not settle out until reaching the Champlain Sea. The sea was eventually cut off from the Atlantic Ocean because of isostatic rebound, and eventually shrunk to form Lake Champlain. Currently, clay from the bottom of Lake Vermont and the Champlain Sea is exposed above water level, and forms much of the base of the Champlain Valley.

The Local Clay Deposit and Its Properties

The clay in Addison County can be classified as estuarine-transported clay, for it was transported by glacial streams into the past arm of the Atlantic Ocean, and bars no relation to underlying rocks. Two subtypes of clay can be found in alternating layers of the soil. The first is blue clay, which existed at a deep portion of the Champlain Sea. The second is brown clay, which existed beneath a shallow portion of the sea. This layered clay, varve clay, is the result of annual variation in past stream flow. The kaolinite clay of the region is very plastic, so it retains its shape after pressure is released. Because of its plasticity, the clay can be molded into any shape and retain it when dry. That clay shape can then be heated to create a hard rock-like material, or a brick. The blue clay is very good for brick making due to its very fine texture, although some contains a considerable percentage of carbonate lime. Brown clay is not constant in character, also containing silt, sand, and gravel.

Brick-making in the 1800’s

Bricks were first fired in Addison County around 1800. The main use of bricks prior to the period was for chimneys, but as a change to the Federal Style of architecture took place, along with a developed fear for major urban fires, brick buildings became more prevalent. Many early brick buildings crumbled at a young age due to the rapid weathering that took place on bricks with a high percentage of carbonate lime. Early brick failure could also have been attributed to the use of impure clay. Clay that did not contain mainly kaolinite, but instead smectite, vermiculite, or a lot of sand and gravel, would have undergone shrinking and swelling in dry and wet conditions.

Bibliography:
- Laws were created early on to regulate the size of bricks to 9 inches in length, 4 ½ inches in depth, and 2 ½ inches in height. Such regulation made it easier for bricklayers to complete projects accurately.

Figure 1. In the towns of Addison, Middlebury, New Haven, and Weybridge, brick architecture is very prevalent. This is a picture of the John Strong House in Addison. It was one of the first brick buildings constructed in Addison County during the 1790’s. Bricks for the house were made on site.

Figure 2. An example of an exposed kaolinite clay pit in East Monkton, VT, and its association with the St. George Fault and other cross-faults. Cheshire Quartzite (Cq) borders the kaolinite on both sides.

The present kaolinite deposits are arranged along a zone of faulting and fracturing at the western border of the Green Mountains. Here are kaolinite and Cheshire Quartzite strata beneath a deposit of glacial till. The rocks that preceded the formation of these strata existed on the bed of the Atlantic Ocean before they were thrust up to where they exist today. During this thrusting process is when the development of the kaolin occurred. The most widely accepted theory is that the kaolinite feltspars of the ocean floor underwent the process of kaolinite through hydrothermal interaction. These simultaneous thrusting and hydrothermal events occurred during the Triassic Period.

Figure 3. The extent of the glacial ice cap during the last ice age. Note that the ice cap extends well beyond the area of study in the Champlain Valley.

Figure 4. The approximate extent of the Champlain Sea 10,000 years ago. The present clay location of Addison County is marked by the orange oval, which, during this period, existed beneath the waters of the sea.

Figure 5. An early clay mine (left), and an early “pug mill” (right).

Figure 6. An example of an early wooden 6 brick mold. Laws were created early on to regulate the size of bricks to 9 inches in length, 4 ½ inches in depth, and 2 ½ inches in height. Such regulation made it easier for bricklayers to complete projects accurately.

Figure 7. An early example of a scove kiln. It sometimes took brick-makers several weeks to construct such massive kilns. But with such volume they could fire all the bricks for one building at once. A brick-makers skill was ultimately determined by how evenly he could burn bricks in a kiln.

Figure 8. The Community House in Middlebury is a perfect example of brick failure. The house has been painted since it was first built to prevent the brick exterior from crumbling off the frame.